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MEMORANDUM
July 1, 1985

To: Darrel Anderson

From: Dale Clark

Subject: Orting Class II Inspection

ABSTRACT

A WDOE Class II inspection was performed at the Orting wastewater treatment plant during July 31 - August 1, 1984. It is a lagoon system that serves a population of about 2,600 and other entities. The purpose was to determine NPDES permit compliance, evaluate treatment plant operation and capacity, and review laboratory procedures. A wide range of water quality analyses and physical measurements were performed. The inspection indicated that the facility is currently overloaded. Either the lagoons need to be enlarged or the influent loads must be decreased to achieve compliance. A number of recommendations also were made concerning general plant operation and maintenance.

INTRODUCTION

During July 31 - August 1, 1984, a Class II inspection was carried out by the Washington State Department of Ecology (WDOE) at the Orting Wastewater Treatment Plant (WTP). The inspection was requested by the WDOE Southwest Regional Office. The study objectives were to:

1. Determine if the WTP was complying with the effluent limitations given in National Pollution Discharge Elimination System (NPDES) permit no. WA-002030-3.

2. Provide information on the treatment efficiency including a description of plant design and operation.

3. Determine if wastewater from the Mazza Cheese Company or other sources significantly contributes to the influent organic load.

4. Compare WDOE and WTP laboratory results and review laboratory procedures.

A receiving water study was not performed as part of the inspection. The stream area in the vicinity of the outfall, however, was visually inspected.

Laboratory analyses for the Orting WTP are contracted to Sumner WTP. Laboratory procedure review and split-sample analyses were performed at Sumner as part of the inspection.

Participants in the inspection included John Bernhardt, Marc Heffner, Mike Behlke, and Dale Clark, WDOE; and Leroy Serosky, WTP operator. Review of laboratory procedures was performed by Sumner WTP employees Hal Stahlhut (plant supervisor) and Greg Kongslie (plant operator), and Dale Clark.

SETTING

The Orting WTP is located approximately 0.6 mile west of Orting off Highway 162 near the bank of the Carbon River, Pierce County (Figure 1). Plant operation began in 1972. Secondary treated effluent is discharged to the Carbon River approximately one mile upstream from the confluence with the Puyallup River. Residential housing, various small businesses, the State Soldiers' Home, and the Mazza Cheese Company plant are known major contributors.

The WTP is a pond system with two cells, an aerated pond followed by a polishing pond. Wastewater enters the system via a headworks which includes a comminutor for physical breakdown of solids (Figures 2 and 6). The influent then enters an aerated pond followed by an unaerated polishing pond (Figures 2, 4, and 5). The treated wastewater then passes through a Parshall flume for flow measurement and enters the chlorine contact chamber for disinfection (Figure 7). Discharge to the Carbon River occurs via a gravity-feed line. Effluent is discharged streamside via a culvert which has a reinforced "flapper" gate. The gate prevents back-flow during high water.

A small service building located on the plant grounds houses the chlorine-feed regulator, chlorine storage tanks, and two overflow pumps for regulating water level in the plant during periods of high flow. A pump intake located in the chlorine contact chamber routes water through the pumps to an auxiliary outlet leading to the receiving water (Figure 2). The overflow system is used when plant flow exceeds the capacity of the gravity discharge pipe and lagoon depth is excessive. Also, a bypass line is available that routes influent directly from the headworks to the chlorine contact chamber (Figure 2). This line is used only in emergency conditions.

The plant operator normally collects influent and effluent samples for laboratory analysis two times per month. The samples are transported to the Sumner WTP within 12 hours of collection. Four grab samples are hand-composited over an eight-hour period (0800, 1100, 1400, and 1530) which represents normal working hours for the operator. Mazza Cheese Company wastewater is sampled monthly by the plant operator using a Manning composite sampler. The city of Orting estimates the Mazza Cheese Company WTP flow by combining water meter readings to the cheese plant and then subtracting cooling water, lunchroom water, and boiler water flows. Flow (gpd) and BOD_5 (mg/L) data are used to calculate the monthly charge for treatment.

METHODS

Samples were collected at three sites during the inspection: (1) plant influent, (2) aerated pond effluent, and (3) final effluent (Figure 2). The Mazza Cheese Company wastewater was sampled at a city manhole just prior to the waste stream joining with the city's domestic sewage. Composite samples were collected at each site using a WDOE Manning automatic composite sampler set to collect a 250 mL sample every 30 minutes. The three treatment plant stations were sampled for about 24 hours, while the cheese company composite was operated from 0800 to 1500 (see Table 1 for sampling times and analyses performed). The WTP operator did not collect samples during the inspection due to other duties. Therefore, the split-sample portion of the inspection for samples collected by Orting was not performed.

Immediately following collection, the WDOE samples were split for later analysis by the WDOE and Sumner laboratories (Table 1). Samples for WTP analysis were placed on ice and transported to the Sumner WTP. The WDOE samples were also placed on ice prior to transporting them to the WDOE Environmental laboratory in Tumwater, Washington.

During a pre-inspection survey, plant maintenance and visual indicators of pond condition were noted.

During the Class II inspection, field measurements were made to determine treatment pond dissolved oxygen (D.O.), sludge depth, and flow recording accuracy. A boat survey was conducted during the Class II inspection to profile pond sludge depth following a two-dimensional surface sampling grid and a Sludge Judge depth indicator; surface D.O. samples were also collected. To check plant flow meter accuracy, a Manning dipper was installed in the Parshall flume, and instantaneous plant flows were taken at the flume.

RESULTS AND DISCUSSION

The 24-hour composite and grab sampling data collected during the survey are given in Tables 2 and 3. These data provide an overview of the survey results and serve as a reference for the discussions that follow.

NPDES Permit Compliance

The analytical results for the NPDES permit parameters are given in Table 4. A summary of noteworthy findings follows.

1. pH values were within the permitted range of 6.0 to 9.0 standard units (S.U.).

2. Biochemical Oxygen Demand (BOD) concentration (mg/L) and loading (lbs/day) exceeded the monthly permit limit, but met the weekly limit. Ninety-four percent of the BOD was removed.

3. Total suspended solids (TSS) concentration (mg/L) and loading (lbs/day) were within the monthly and weekly permit limits.

4. Effluent fecal coliform (FC) concentrations (24 est. and 16 est. col/100 mL) were well within the permit limits for both monthly and weekly limits (200 and 400 col/100 mL, respectively).

5. Plant flow was within the average monthly limit.

During the inspection the plant was generally meeting permit requirements with the exception of the monthly BOD limit. However, permit compliance for BOD in the effluent was marginal and would probably exceed permit limits during periods of lower temperature and sunlight. The theoretical treatment capability of the WTP is discussed further in the following section.

Treatment Plant Capacity

At the time of the Class II inspection, the treatment plant was removing 94 percent of the influent BOD, which is considered excellent. BOD removal efficiencies for aeration lagoons normally range from 80 percent to 90 percent (WDOE, 1980). However, the NPDES monthly permit limit was exceeded by 33 percent, apparently because the influent BOD load exceeded plant capacity. Since aerated lagoons operate best when temperatures are warm and daylight hours are long, the plant should have been operating near maximum efficiency during the survey. Removal efficiencies for BOD during lower temperature and shorter daylight conditions (fall, winter, and spring) were estimated using the following design criteria equations (WDOE, 1980):

$$K1 = \frac{(\frac{S_o}{S}) - 1}{2.3\ t} \qquad \text{(Equation 1)}$$

where:

K_1 = reaction coefficient (at 22.5°C)
t = detention time at 13.7 days (0.32 MGD plant flow)
S_o = influent BOD (640 mg/L)
S = aeration pond effluent BOD (72 mg/L)
K_1 for inspection = 0.2504

and:

$$K_t = K_{20}\ 1.047^{(T-20)} \qquad \text{(Equation 2)}$$

where:

K_t = reaction coefficient at given temperature
T = wastewater temperature (°C)

Thus, to find K_{20}:

K_t = 0.2504
T = 22.5

then:

K_{20} = 0.2232

Based on the design criteria equations above, Table 6 below indicates that removal efficiency drops as temperature declines. Correspondingly, during the winter, NPDES permit violations would probably increase.

Treatment capacity with respect to the organic load was estimated by two methods. First, using the original design population of 2,600 and 0.2 lb/day BOD_5 produced per citizen (WDOE, 1980b), plant capacity was calculated to be 520 lbs BOD_5/day. This estimate does not assume loading from other sources (i.e., Mazza Cheese Company). Second, the treatment plant capacity was estimated by solving for S_0 in Equation 1, above, and based on the following assumptions:

1. A detention time of 13.7 days, based on flow measured during the inspection.
2. A 50 percent BOD removal efficiency for the polishing pond.
3. A final effluent concentration of 30 mg/L, the NPDES permit limit for BOD.

Table 6. Treatment capacity with respect to influent BOD loading at varying temperatures.

Temperature (°C)	Reaction Coefficient (K_1)	Treatment Capacity expresed as influent BOD Load (lbs/day)
22.5	0.2504	1,421
20	0.2232	1,285
15	0.1774	1,053
10	0.1410	872
5	0.1121	725

During winter (5°C), the polishing pond probably removes far less than 50 percent of the BOD_5 applied. Assuming 25 percent removal during cold weather (moderate worst-case conditions), the 725 lbs/day WTP capacity estimate drops to 483 lbs/day. Thus about 520 lbs/day appears appropriate for winter BOD loading for this facility. This estimate is somewhat lower than the estimate of 705 lbs/day given in the city records (PAC-TECH, 1985).

Plant flow and BOD data for 1984 through September from the WTP Daily Monitoring Reports (DMRs) are given in Table 7. The BOD_5 concentrations are based on limited analyses (one to two per month for BOD_5 and daytime grab composite sampling. Table 7 includes flows corrected for plant flow meter inaccuracy discovered during the inspection. Plant meter script chart readings appeared to be about 25 percent high when compared to instantaneous WDOE flow measurements at the Parshall flume (0.41 versus 0.32 MGD). Comparison of the WDOE Manning dipper flow meter totalizer measurement to the WTP totalizer measurement suggests the same bias. Total flow for 24 hours as recorded by the dipper was 0.34 MGD as compared to the plant meter measurement of 0.41 MGD. The WTP totalizer error results in an overestimate of BOD loadings reported on the DMRs.

At the time of the Class II inspection, the influent BOD load was 1770 lbs/day. This loading rate appears fairly typical for the facility (Table 7). When the BOD loads are compared to the estimated 520 lbs/day BOD_5 capacity, serious overloading during non-optimum winter conditions is likely. Because of the high winter flows, BOD_5 permit loading violations are often of greater magnitude than concentration violations.

Figure 3 shows surface oxygen concentration and sludge depth measured in the aerated pond during the Class II inspection. Results indicate that the pond was well below the recommended minimum 1.0 mg/L dissolved oxygen (EPA, 1977). The organic loading described above is a possible cause of the low D.O.s observed. Sludge depth in the aerated pond ranged from zero to five feet (Figure 3). The greatest sludge depth was at the southwest corner. The pond is irregular in shape and this corner is farthest from the aerators. Reduced circulation could account for the solids accumulation in this area. To improve circulation, relocation of the aerators or the addition of a third aerator should be considered.

The aerated pond was experiencing one obvious visible problem at the time of the inspection. Gas produced under the pond liner was forcing the liner to the surface in some areas. Large "bubbles" measuring several feet across were interspersed around the pond. Table 8 estimates that the gas bubbles decreased pond capacity by approximately 70,000 gallons, and detention time was reduced by about 4 1/2 hours during the inspection. Because the bubbles were neither fixed in size nor location, volume and detention time reductions are likely variable. Although volume reduction is small, the bubbles also may disrupt the circulation of wastewater through the pond, thus reducing treatment. The disruption in circulation could account for the previously mentioned sludge buildup in the southwest corner of the aerated pond. Stretching and exposing the liner to ultraviolet radiation from sunlight may be degrading the liner and reducing its service life. Holes in the liner could result in groundwater contamination. It is recommended that the bubbles be repaired at the earliest possible time in a manner that both releases the gas and prevents leaking of any liquid from the lagoon.

The polishing pond D.O. concentrations at the surface also were low (equal to or less than 0.5 mg/L) (Figure 3). Sludge depth was approximately 25 percent of total water depth, reducing treatment capability. Future monitoring of the sludge depth and treatment capacity in this pond would be appropriate. If sludge depth increases, clean-out should be considered.

During the survey, a heavy growth of duckweed was observed covering a significant portion of the polishing pond. Aquatic growth of this type reduces treatment capacity by reducing available light for algal growth and limiting surface motion essential for oxygenation (EPA, 1977). Weed growth should be controlled by routine removal or elimination when possible. Table 9 notes this and other general lagoon condition observations found during the walk-through portion of the inspection.

The chlorine contact chamber is designed for 60 minutes' detention at design flow (0.38 MGD) (PAC-TECH Engineering, Inc., 1985). During the inspection, a dye study was conducted that demonstrated a minimum detention time of 13 1/2 minutes, suggesting that short-circuiting occurs; also some of the dye lingered in the chamber for several hours, indicating dead areas exist. This pattern can result from insufficient baffling. Sludge depth was determined to be five feet at the front of the chamber, two feet in the center, and minimal at the exit. Sludge reduces detention time and should be removed.

Chlorination is presently accomplished by an automatic regulator (Fisher and Porter) that delivers up to 20 pounds of chlorine per day. Presently 7 to 7 1/2 pounds of chlorine are delivered per day. The rate of delivery is at the lowest regulator adjustment. During the inspection, chlorine residual measurements of 2.0, 0.6, and 1.0 mg/L were made along with fecal coliform counts of 24 est. and 16 est./100 mL (Table 3). The regulator appears to be oversized for the plant flow given the present low FC counts coupled with high effluent chlorine concentrations.

Mazza Cheese Company and Other Loading Sources

At the time of the inspection, Mazza Cheese company accounted for 7.4 percent of the total flow and 29.9 percent of BOD_5 load to the plant (Table 7). A new water meter was installed at Mazza Cheese Company in March 1984 that increased the accuracy of flow measurement. Calculations based on city records after the meter installation estimate that Mazza Cheese Company's average daily contribution during production was about 4.8 percent of the total influent flow and 22 percent of the BOD_5 loading (Table 7). Mazza Cheese Company daily flows during production were calculated by dividing monthly average sewage flow by the number of days Mazza Cheese Company operated during a given month (Table 10). This method of flow calculation is the method used by the city, but it is probably inaccurate. A single flow meter on the line that discharges the company's effluent to the city sewer line is needed.

In addition to Mazza Cheese Company, the only other known major source besides the general population served is the state-operated Old Soldiers Home. The home has a resident population of 188, and a full-time staff of 125 plus 20 part-time employees (Wash. State Veterans Home, 1985). Organic loading from the home was estimated to be 56.5 pounds BOD/day, at a concentration of 360 mg/L (Table 10) EPA, 1980). A mean value of 454 mg/L (± 99 mg/L standard deviation) was calculated for sources other than Mazza Cheese Company that contributed to influent BOD_5 strength (Table 6). The value was based on flow and BOD_5 data from DMR, Class II inspection, and city records for WTP influent and Mazza Cheese Company wastewater. This value does not correspond well with predicted average domestic BOD strength of 200 to 300 mg/L (WDOE, 1980). Monitoring to more accurately determine waste strengths and flows from the major contributors and the WTP is necessary. If the 454 mg/L BOD_5 estimate is correct, a search for previously unaccounted for sources of loading should be conducted.

Memo to Darrel Anderson
Orting Class II Inspection

LABORATORY PROCEDURES REVIEW

The laboratory review consisted of four main elements: (1) Sampling Protocol, (2) Split Sample Results, (3) BOD Procedures, and (4) TSS Procedures. The laboratory procedural review form is included in this report following Table 11.

1. Sampling Protocol

As previously stated, the Orting WTP operator composites samples by hand once per month. Grab samples are collected on a time schedule designed by the plant operator (equal volumes at 0800, 1100, 1400, and 1530).

The hand-compositing method appears to be inadequate for influent sampling. Influent flow and loading vary substantially during a normal 24-hour sampling period. The Mazza Cheese Company, a major contributor to plant BOD loading, normally operates between 0300 and 1700 hours. Loading from other businesses and domestic sources is also greater during the day. Samples collected only during the day probably result in overestimates of influent BOD. A 24-hour automatic sampler should be used. Because of suspected differences in waste strength during the course of the day, a flow-paced influent composite should be collected if feasible. Effluent quality is more homogeneous due to the lengthy retention time in the treatment ponds. However, a 24-hour compositor should also be used to monitor final effluent quality to maintain continuity of sampling procedures. The time-composited sampling of the Mazza Cheese Company wastewater is probably adequate; however, flow compositing would be better, if feasible.

2. Split Sample Results

The results of the 24-hour composite samples split with the Sumner WTP are given in Table 11. The results indicate a 26 percent mean difference between laboratories for three BOD analyses (influent, effluent, and Mazza Cheese Company wastewater). For all BOD analyses, Sumner WTP results demonstrated lower concentrations than WDOE. EPA quality assurance (QA) samples also were given to the WTP for analysis. One analysis was 18 percent lower than the QA sample (103 vs. 84 mg/L) accepted true value. The other concurred with the EPA results (2.6 mg/L). Both test results were in the acceptable 95 percent confidence interval with the less accurate test result being on the low end of the acceptable range.

Total suspended solids (TSS) results indicate poor comparison between laboratories, the difference being over 30 percent (Table 11). The WTP influent results were lower than WDOE's, while the opposite was observed with the effluent sample. The Mazza Cheese Company sample split was much closer, with a 7 percent difference in values. The EPA QA sample indicated a fair comparison between the true value and the WTP analysis (35 vs. 26 mg/L), with the WTP value being 26 percent lower. The WTP analysis was within the 95 percent confidence interval.

3. BOD Procedures

Sumner WTP uses the BOD laboratory procedure described in Standard Methods (APHA-AWWA-WPCF, 1980). Effluent samples are dechlorinated when necessary using potassium iodate titrant to determine the amount of sodium thiosulfate needed. Samples are then re-seeded using the influent supernatant. The seed material is added to the BOD bottle just prior to testing.

The five-day D.O. depletion for the blank is determined and normally falls within a range of 0.1 to 0.2 mg/L. The normal range of initial (zero-day) D.O. is 9.0 to 9.1 mg/L, near saturation of 9.2 mg/L at 20°C and sea level. The elevation of the WTP is approximately 200 feet. BOD calculations are based on sample dilutions and not dilution water blanks.

Low BOD results when compared to WDOE and USEPA analysis were noted in the split sample results section above. The differences observed could be the result of underestimating the initial (zero-day) D.O. and/or incubator temperature varying from optimum temperature (20°C). Underestimation of initial D.O. can result from incorrect meter readings, from calibration error, or from meter malfunction. BOD dissolved oxygen is determined usig a YSI D.O. meter. The meter is calibrated against D.O.s analyzed by Winkler titration whenever BODs are performed. Phenylarsine oxide (PAO) pillows are used as the titrant; however, the PAO is not standardized. To ensure accuracy, each batch of PAO should be standardized using the approved method found in Standard Methods (APHA, 1980) or the WDOE BOD manual (1983). Incubator temperature is checked by a mercury thermometer attached to the incubator. A log is not maintained. It is recommended that temperature be checked using a mercury thermometer immersed in a water bath located on the same shelf as the BOD samples. Temperature should be checked twice daily, and if fluctuation from 20°C is a problem, a log book should be kept. Both of these procedures are needed to ensure a constant sample temperature of 20°C (± 1°C). An improper incubator temperature can result in irregular microbe activity during incubation and unpredictable oxygen demand.

pHs of BOD samples are normally not checked to ensure they fall in the range of 6.5 to 8.5. It is recommended that the pH be checked prior to analysis. Due to the wide pH swings of the Mazza Cheese effluent (Table 3), this appears to be particularly important for the BOD samples. If the pH is out of this range, the samples should be adjusted using sodium hydroxide or sulphuric acid. pH is measured using a pH meter. It is recommended that the meter be calibrated before each BOD test.

4. TSS Procedures

TSS is determined based on Standard Methods (APHA-AWWA-WPCF, 1980). The samples are filtered through 9 cm glass fiber filters and a Gooch crucible. The filters are prewashed and dried for one hour at 103°C. Following drying, the filters are cooled in a desiccator, weighed, and used immediately. Following filtration, the filters and crucible are dried for one hour and allowed to cool in a desiccator prior to weighing and re-weighing. The filters are not re-dried prior to the re-weighing procedure.

The laboratory review did not identify any major problems with technique that would account for the analytical differences noted previously in the Split Sample Results Section. Two possibilities that could be checked are laboratory scale calibration and assuring that the oven temperature does not get too high during drying. Other recommendations include repeating drying and cooling cycle prior to re-weighing until a constant filter weight is obtained or until the weight loss is less than 0.5 mg.

Visual Inspection at Outfall Site - At the time of the inspection, the treated wastewaters were being discharged onto the stream bank about five feet from the receiving stream. The wastewater appeared to quickly dissipate. A receiving water survey was not practical becaue of high flow and turbid conditions in the river.

SUMMARY AND CONCLUSIONS

During the inspection, effluent at the Orting WTP exceeded the monthly NPDES permit concentation loading for BOD_5. The plant appeared to be organically overloaded under the conditions that existed during the inspection. Influent strength was unusually high. Weather conditions during the inspection were considered optimum for lagoon efficiency. The overload problem would likely be much more severe during the colder winter months. It was estimated that the organic load might exceed plant capacity by about three-fold during such cold-weather periods.

Recommendations necessary to improve monitoring and plant operation include:

1. A 24-hour influent sample appears necessary to properly estimate plant loading. A flow-paced composite is preferable if feasible. A flow-paced composite is also recommended for sample collection at the Mazza Cheese Company wastewater discharge. Also, an improved flow-monitoring system for the Mazza Cheese Company wastewater is needed. A flow meter on the discharge line from Mazza Cheese Company to the city sewer line is recommended. Measuring actual loads to the WTP from the Mazza Cheese Company and the State Soldiers Home should be done to determine if any other high BOD_5 contributors are on the system.

2. Due to the unaccountably high influent BOD strength, monitoring of BOD sources to determine loading and strength is needed.

3. Problems with the treatment lagoons were noted during the inspection. Problems included:

    a. Bubbles in the aerated lagoon liner were protruding above the water surface. Venting these bubbles in a manner that both releases air and prohibits liquid leakage is necessary. Repair is necessary to prevent disruption of circulation patterns in the lagoon and to protect the integrity of the liner.

b. D.O. concentrations were low in the aerated pond (average on the surface 0.4 mg/L). Also, sludge depth in the south corner of the pond was considered excessive (five feet). Evaluation of aerator oxygenation and mixing capabilities is necessary.

c. Duckweed growth in the polishing pond was becoming a problem. The duckweed should be removed regularly.

d. Sludge depth in the polishing pond was approximately 1/4 of the total depth. The sludge depth should be routinely monitored (two to three times per year) and sludge removal considered if the depth increases significantly.

e. Better control of weed growth in and around the ponds is needed. Such growth can have a major deleterious effect on circulation and plant treatment efficiency.

f. Control of burrowing rodents in the dikes is needed to decrease the chance of dike breaching.

4. Calibrate the flow meter at the WTP to provide accurate flow-monitoring data. The meter calibration should be checked routinely with instantaneous checks at the Parshall flume.

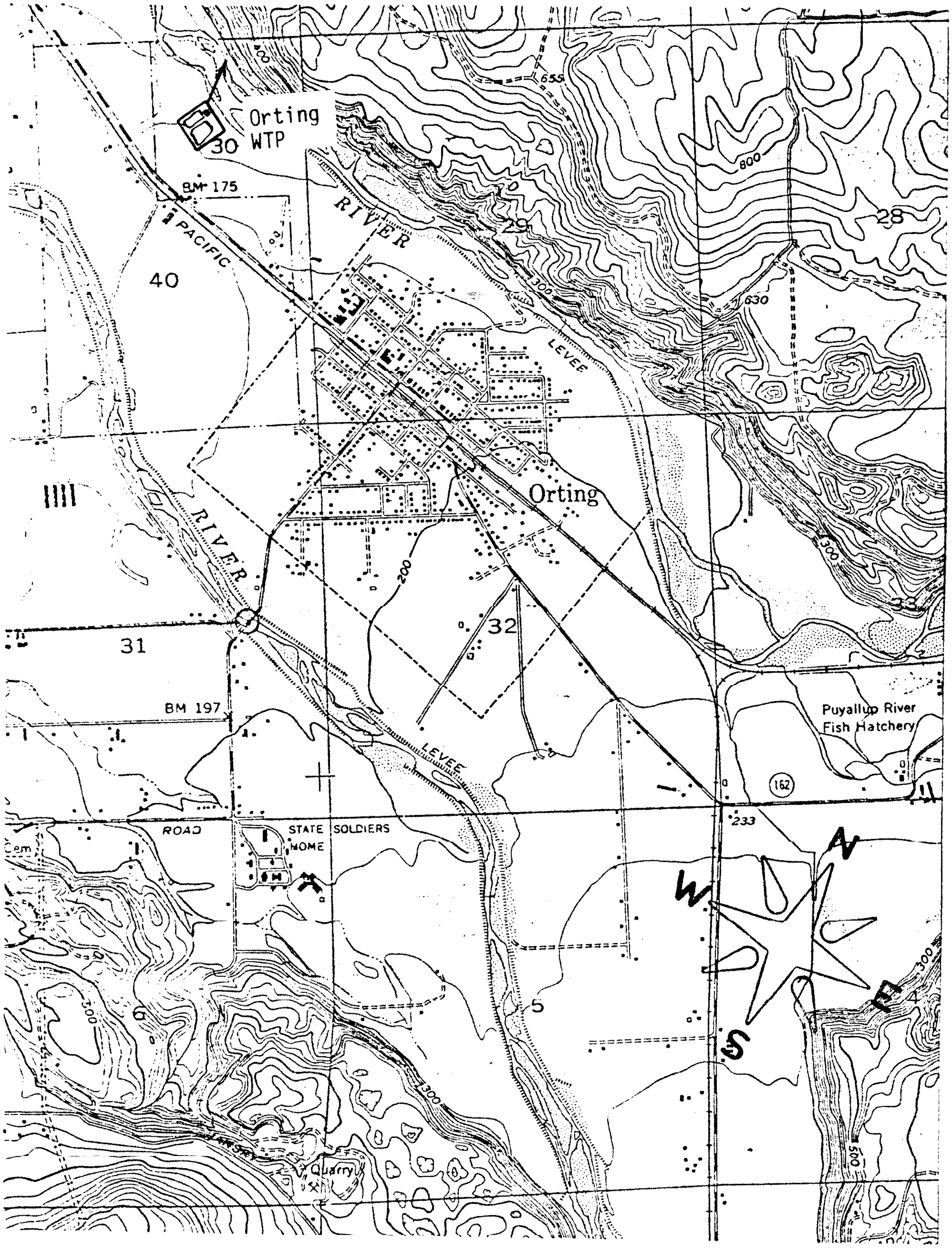
5. Modification of the chlorine regulator to allow a lower chlorine feed rate and improved baffling in the chlorine contact chamber to prevent short-circuiting are needed. Also, sludge deposits should be removed from the chlorine contact chamber to better use available detention time.

6. Increased effort to reduce vandalism of the flood gate and return the gate to proper working condition is necessary. This could be accomplished by installing a steel grate around the gate. The grating would have the added benefit of protecting the gate from uprooted trees carried downstream during periods of high stream flow.

None of the above recommendations will solve the NPDES permit violations at the treatment plant. Either the lagoons need to be enlarged or the influent loads must be decreased to achieve compliance.

DC:cp

Attachments



1 mile

Scale: 1:24,000

Figure 1. Map showing the location of the Orting Wastewater Treatment Plant, Soldiers Home, and the town of Orting for the WDOE Class II inspection, July 31 - August 1, 1984.

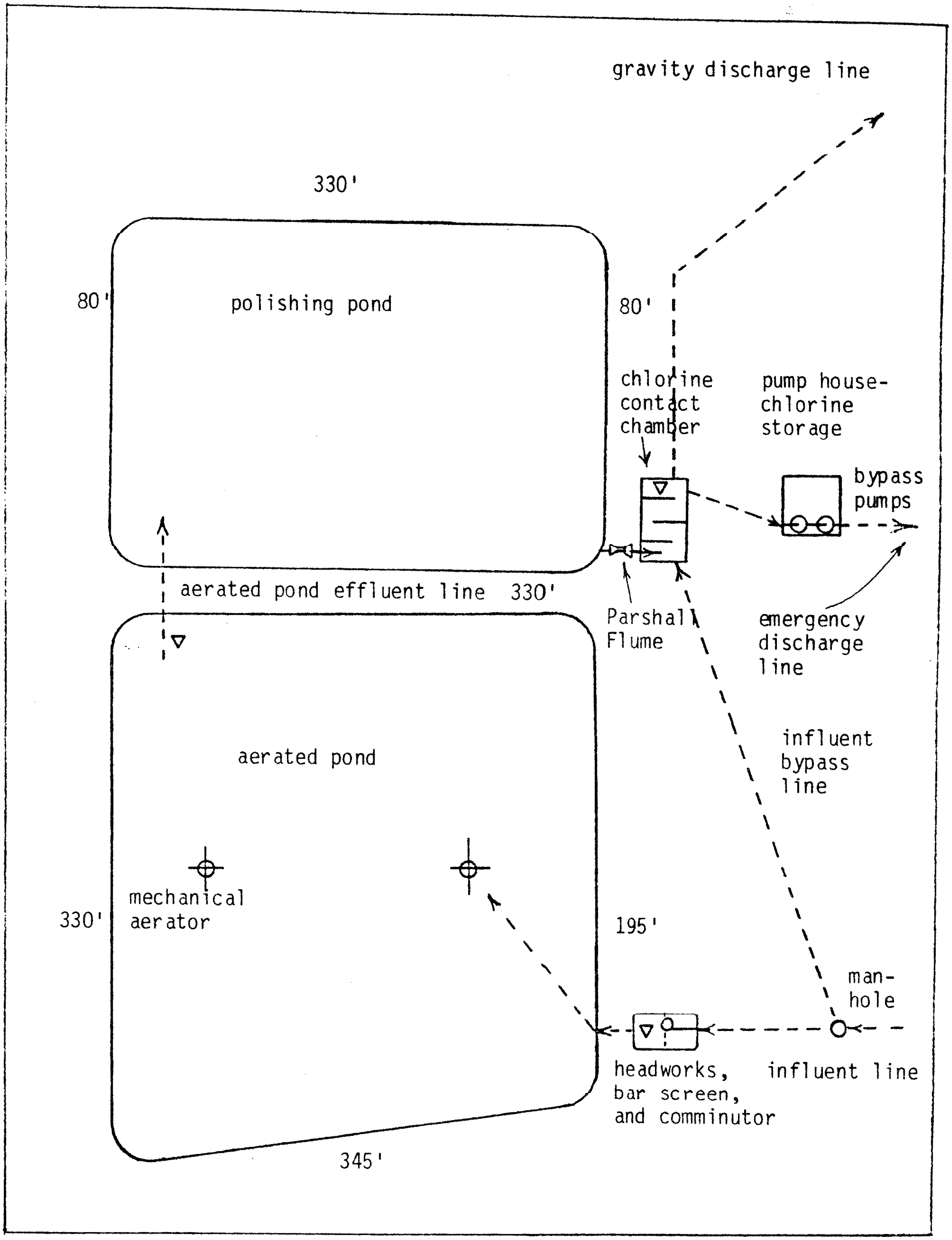


Figure 2. Orting Wastewater Treatment Plant flow diagram for WDOE July 31 - August 1, 1984, Class II inspection.
= composite and grab sampling locations.

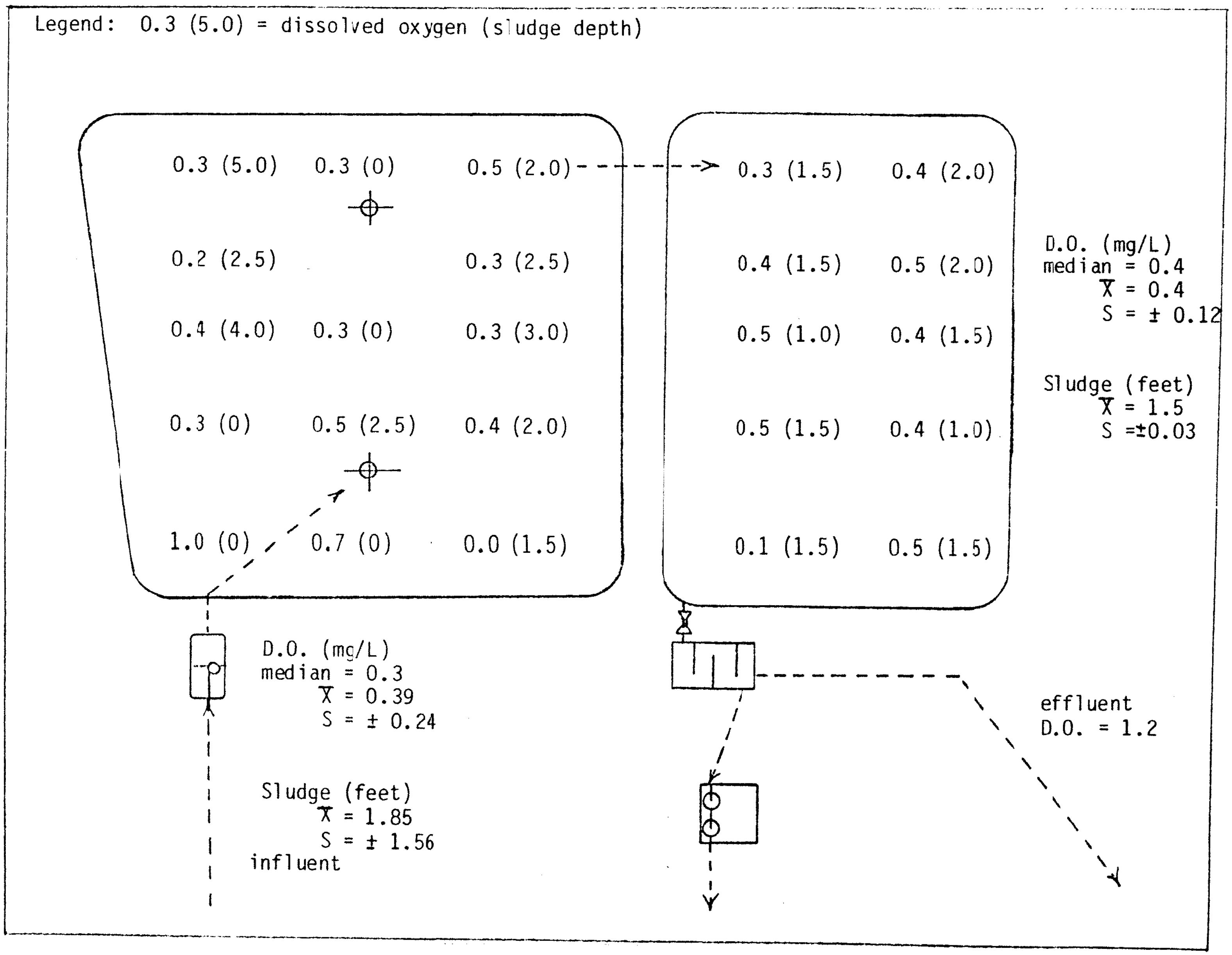


Figure 3. Orting Wastewater Treatment Plant dissolved oxygen (D.O.) profile and sludge depth readings taken during the WDOE Class II inspection July 31 - August 1, 1984. EPA recommends 1.0 mg/L D.O. (EPA-430 9-77-012).

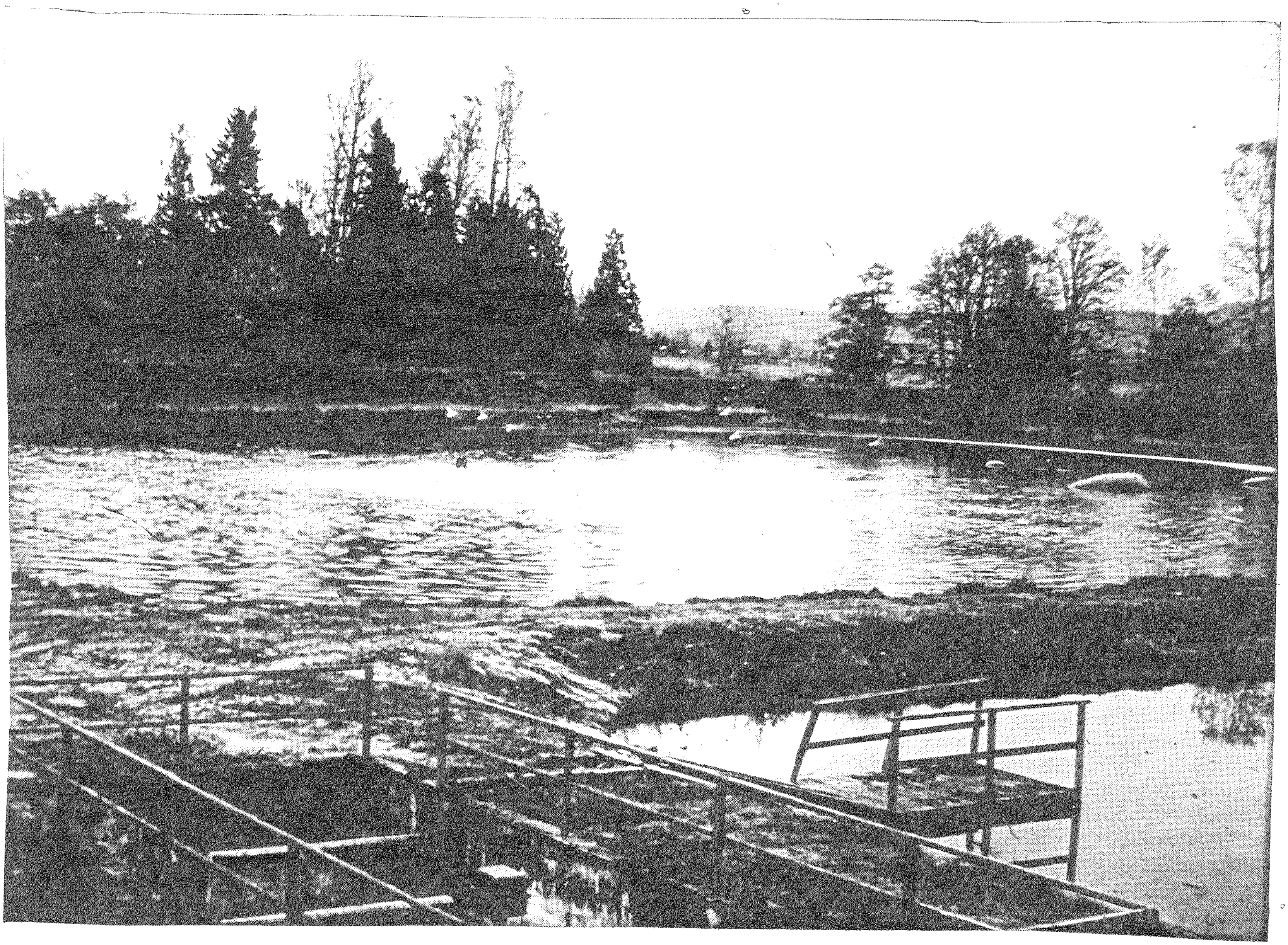


Figure 4. Orting Wastewater Treatment Plant aerated pond, WDOE Class II inspection, July 31 - August 1, 1984. Note bubbles in liner.

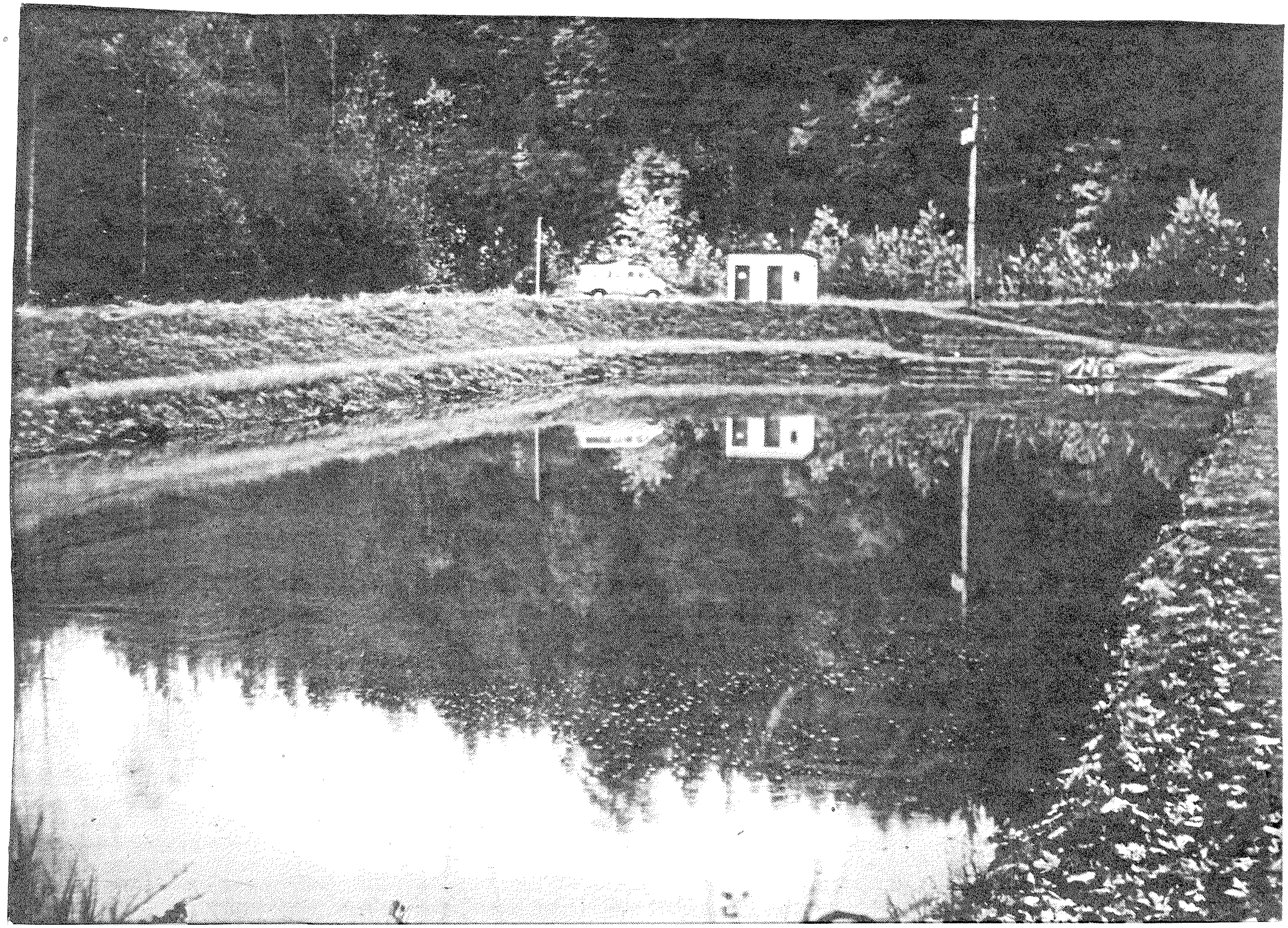


Figure 5. Orting Wastewater Treatment Plant polishing pond and on-site building housing emergency pumps (2), chlorine regulator, and chlorine storage tanks, WDOE Class II inspection, July 31 - August 1, 1984.

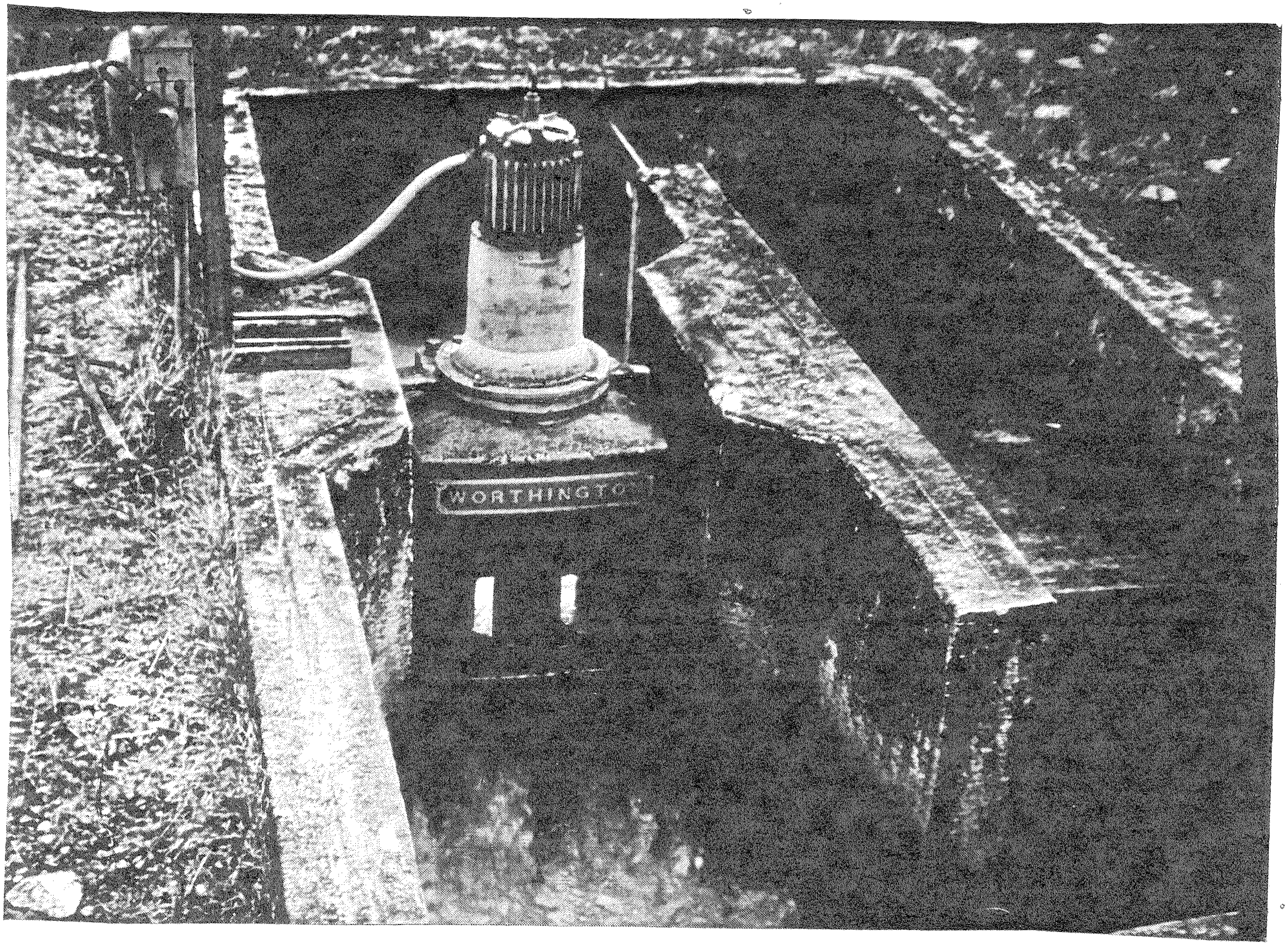


Figure 6. Orting Wastewater Treatment Plant headworks and comminutor, WDOE Class II inspection, July 31 - August 1, 1984.

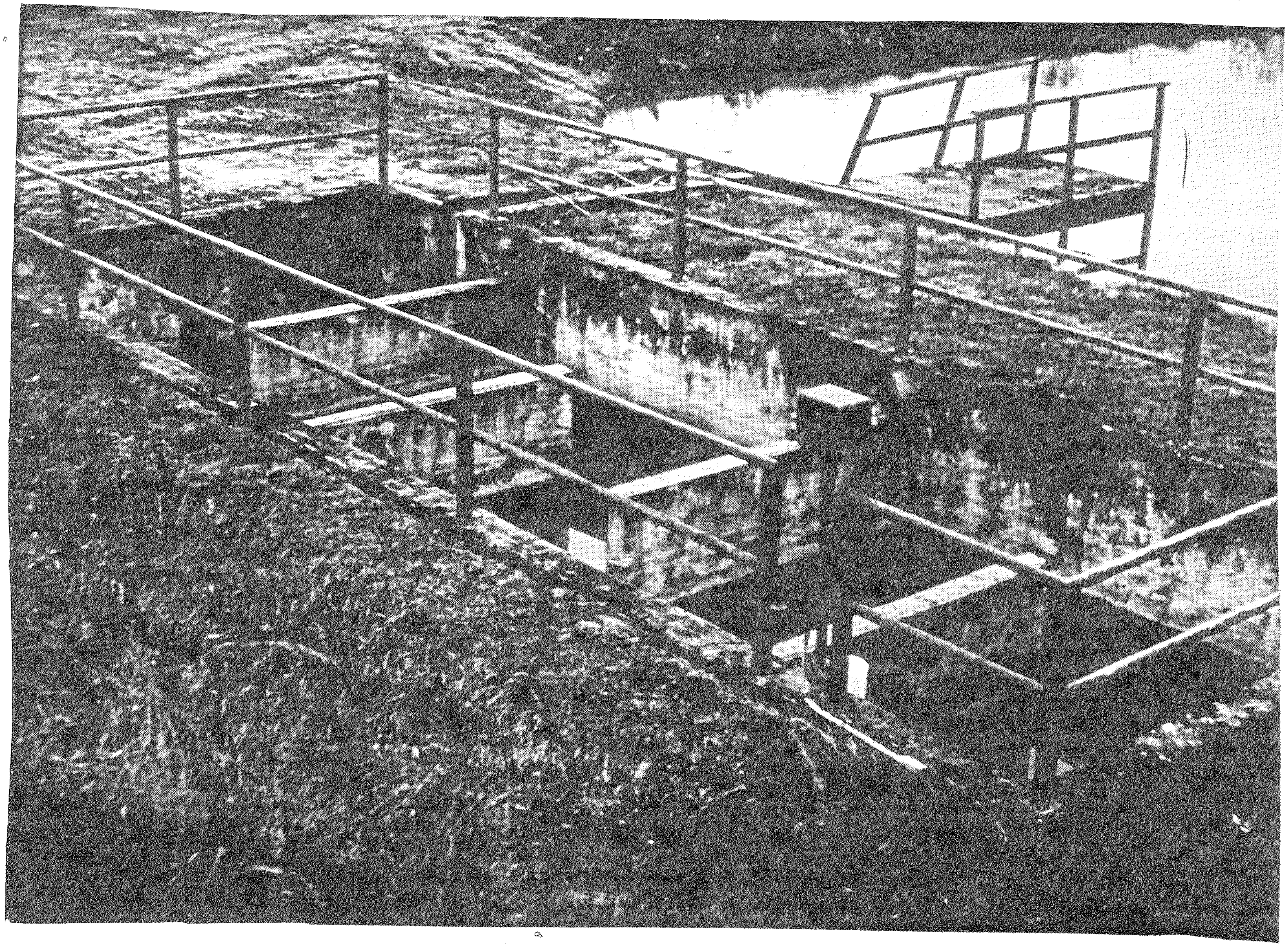


Figure 7. Orting Wastewater Treatment Plant chlorine ccntact chamber, WDOE Class II inspection, July 31 - August 1, 1984.

Table 1. Sample times and locations for WDOE July 31 - August 1, 1984, Orting Class II inspection (all samples WDOE).

Composite Samples

Sample	Installation Date (time in - time out)		Total time (hours)	Location
Mazza Cheese Company	7/31/84	0845 - 1540	6.8	Cheese plant 4" discharge to sewer
Aeration lagoon influent	7/31/84	0910 - 0930	24.3	Influent channel following comminutor
Aeration lagoon effluent	7/31/84	1050 - 1010	23.3	Mid-depth of pond at approximate outlet location
Polishing pond effluent	7/31/84	0935 - 0940	24.2	Chlorine contact chamber discharge

Grab Samples

Sample	Collection Date (time)	Laboratory Analyses	Field Analyses
Mazza Cheese Company	7/31/84 (0830)1/ (1545) 8/01/84 (0917)		pH, temp., cond., D.O.
Aeration pond influent	7/31/84 (0915)1/ (1505)1/ 8/01/84 (0930)		pH, temp., cond., D.O.
Aeration pond effluent	7/31/84 (1050) (1520) 8/01/84 (1045)		pH, temp., cond., D.O.
Polishing pond effluent	7/31/84 (0935)2/ (1106) (1525) 8/01/84 (1015)1/ (1025)2/	turb., F.C.	pH, temp., cond., D.O., total resid. chlorine, F.C.

1/Dissolved oxygen not measured.

2/Total residual chlorine not measured.

Table 2. Summary of WDOE composite sampling data collected at Orting Wastewater Treatment Plant (WTP) during July 31 - August 1, 1984 (all concentrations are mg/L unless otherwise noted).

			Field Analysis					Laboratory Analysis															
Sample	Laboratory	Date	Time In	Time Out	Temp. (°C)	pH (S.U.)	Spec. Cond. (umhos/cm)	BOD_5	Soluble BOD_5	COD	TS	TNVS	TSS	TNVSS	pH (S.U.)	Spec. Cond. (umhos/cm)	Turb. (NTU)	NH_3-N	NO_2-N	NO_3-N	Dis. O-PO_4-P	T. PO_4-P	Alkalinity ($CaCO_3$)
Mazza Cheese	WDOE	7/31/84	0845	1540	4.2	7.5	>1000	2600	800	3700	2900	730	640	10	7.4	1300	420	7.0	<0.25	18	31	62	210
	WTP*	7/31/84						2047					591										
Influent	WDOE	7/31/84	0910	0930	6.3	7.5	640	640		760	1100	300	680	33	7.0	589	220	11.0	<0.10	1.1	9.0	12	140
	WTP*	8/01/84						504					457										
Aeration Pond Effluent	WDOE	7/31/84 8/01/84	1050	1010	3.0	7.7	850	72		210	580	370	54	9	7.5	798	67	9.1	<0.10	<0.10	9.1	12	220
Polishing Pond Effluent	WDOE	7/31/84	0935	0940	5.5	7.7	900	40		150	560	390	32	6	7.7	796	39	9.5	<0.10	<0.10	9.3	11	210
	WTP*	8/01/84						26					50										

*Analysis by Sumner WTP laboratory.

Table 3. Grab sample results - Orting Wastewater Treatment Plant (WTP) during July 31 - August 1, 1984.

Sample	Date	Time	Field Analysis: Temp. (°C)	Field Analysis: Specific Conductivity (umhos/cm)	Field Analysis: pH (S.U.)	WDOE Laboratory Analysis: Total Chlorine Residual (mg/L)	WDOE Laboratory Analysis: Fecal Coliform (col/100 mL)	WDOE Laboratory Analysis: Turbidity (NTU)	WDOE Laboratory Analysis: Dissolved Oxygen (mg/L)
Mazza Cheese Co.	7/31/84	0930	18.6	>1,000	7.0				3.1
	7/31/84	1545	36.6	540	2.95				4.5
	8/01/84	0917	34.2	>1,000	12.5				
Influent	7/31/84	0915	18.8	489	7.2				
	7/31/84	1505	20.0	>1,000	7.4				
	8/01/84	0930	18.5	900	7.1				1.0
Aeration Pond Effluent	7/31/84	1050	23.6	799	7.5				0.1
	7/31/84	1520	23.7	840	7.5				0.3
	8/01/84	1045	21.8	850	7.5				1.0
Effluent from Chlorine Contact Chamber	7/31/84	0935	21.7	840	7.3				1.1
	7/31/84	1106				2.0			0.8
	7/31/84	1525	25.4	860	7.5	0.6			1.3
	8/01/84	1015	21.4	850	7.4	1.0	24*, 16*	39	1.8

*Estimated.

Table 4. Comparison of Class II inspection data to NPDES permit limits - Orting WTP, July - August 1984.

Parameter	24-hr Composites: WDOE Analysis	24-hr Composites: Sumner WTP[1/] Analysis	NPDES Permit Limits: Monthly	NPDES Permit Limits: Weekly	NPDES Permit Limits: Daily
BOD_5					
(mg/L)	40	26	30	45	
(lbs/day)*	107	69	95	143	
(% removal)	94	96			
TSS					
(mg/L)	32	50	75	113	
(lbs/day)*	85.4	133.4	238	358	
(% removal)	95	89			
Fecal Coliform					
(col/100 mL)	24 est.,† 16 est.†		200	400	
Chlorine Resid.					
(mg/L)	1.0,† 1.5†		Sufficient to maintain FC limit		
pH					
(S.U.)	7.7, 7.3†, 7.5†, 7.4†			$6.0 \leq pH \leq 9.0$	
Flow					
(MGD)	0.32[2/]		0.75[3/]		

* = Based on corrected plant flow.

† = Grab samples collected during the July 31-August 1, 1984, Class II inspection.

[1/] Sumner WTP is contracted to perform all analyses for the Orting WTP.

[2/] Corrected flow based on observed differences between flow measurements taken from the WDOE Manning dipper and the flow from the automatic flow recorder script chart. The automatic flow measurement displayed values 25 percent higher than measured values.

[3/] Design flow as noted on the NPDES permit is 0.38 MGD.

Table 5. Plant treatment efficiency based on detention time (13.7 days at 0.32 MGD) as it would vary due to temperature in Orting WTP lagoons.

Temperature (°C)	K_1 1/	BOD5 Influent 2/ (mg/L)	BOD5 Aeration Pond Effluent (mg/L)	BOD5 Final Effluent (mg/L) 3/	Percent above NPDES Limit 4/	Removal Efficiency (percent)
22.5 3/	0.2504	640	72	40	33	94
20.0	0.2232	640	80	45	50	93
15.0	0.1774	640	97	54	80	92
10.0	0.1410	640	118	66	120	90
5.0	0.1121	640	141	79	163	88

1/K1 = Reaction coefficient, aerated lagoon based on a plant flow of 0.32 MGD, detention time of 13.7 days, and a temperature of 22.5°C - operating conditions during WDOE Class II inspection.

2/Influent BOD_5 concentration for WDOE 24-hour composite, WDOE Class II inspection, July-August 1984.

3/Final effluent based on a 56 percent reduction of primary pond effluent in the polishing pond as observed during the WDOE Class II inspection.

4/NPDES permit limit monthly average for BOD_5 - 30 mg/L.

Table 7. Flow and BOD_5 influent loadings for Orting WTP, Mazza Cheese, and other sources (1984 DMR and WDOE Class II inspection data).

Month	WTP			Mazza Cheese					Other Sources[3/]				
	Flow	BOD_5		Flow		BOD_5			Flow		BOD_5		
	(MGD)[1/]	(mg/L)	(lbs/D)	(gpd)[2/]	(Percent of total)	(mg/L)	(lbs/D)	(Percent of total Load)	(MGD)	(Percent of Total)	(mg/L)	(lbs/D)	(Percent of total Load)
January	0.77	300	1,922	7,914	1.0	350	23	1.2	0.76	99.0	299	1,899	98.8
February	0.45	730	2,712	12,022	2.7	2,050	206	7.6	0.44	97.3	682	2,506	92.4
March	0.64	245	1,307	18,048	2.8	1,200	181	13.9	0.62	97.2	217	1,126	86.1
April	0.54	632	2,862	18,615	3.5	1,800	280	9.8	0.52	96.5	595	2,582	92.2
May	0.62	456	2,370	19,313	3.1	3,000	484	20.4	0.60	97.9	376	1,886	79.6
June	0.52	417	1,800	18,963	3.7	2,925	463	25.7	0.50	96.3	320	1,337	74.3
July	0.38	555	1,770	17,721	4.7	2,935	434	24.5	0.36	95.3	444	1,336	75.5
Class II data	0.34[4/]	640	1,815	25,000	7.4	2,600	542	29.9	0.32	92.6	476	1,273	69.1
August	0.32	669	1,758	16,457	5.1	2,533	348	19.8	0.30	94.9	562	1,410	80.2
September	0.29	507	1,226	18,361	6.3	2,075	318	25.9	0.27	93.7	402	908	74.1
$\bar{X}$[5/]	0.43	554	1,943	19,204	4.8	2,552	410	22.3	0.41	95.3	454	1,533	77.9
S	±0.13	±98	±523	±2,722	±1.6	±462	±96	±6.5	±0.13	±1.8	±99	±544	±7.3

1/Reported flows reduced by 25 percent.

2/Average value based on monthly water meter readings and number of production days.

3/Calculated value, includes Washington State Soldiers Home flow and BOD_5 estimate (Table 10).

4/From July 31-August 1, 1984, Class II inspection, flows determined using WDOE Manning dipper approximately 25 percent less than flow recorded by plant meter.

5/Mean and standard deviation based on April-September data following March installation of third flow meter at Mazza Cheese.

Table 8. Physical description of Orting WTP unit processes, July-August 1984.

Treatment Unit	Depth (feet)1/	Volume (feet^3)	Volume (gallons)	Detention time (days)2/
Aerated Pond without bubbles1/	8	586,136	4,384,900	13.7
Aerated Pond with bubbles		576,411	4,312,100	13.5
Polishing Pond	6	141,600	1,059,300	3.3
Polishing Pond	4.53/	106,200	794,500	2.5
Chlorine Contact Chamber	7	3,000	22,500	0.074/

1/Water depth in aerated lagoon and polishing pond based on mean depth observed during WDOE Class II inspection.

2/For a plant flow of 0.32, the corrected plant flow observed during the July 31-August 1, 1984, Class II inspection.

3/Depth of polishing pond minus sludge blanket as observed during WDOE Class II inspection. Sludge depth is approximately 25 percent of total depth.

4/Chlorine contact chamber detention time is equivalent to 101 minutes.

Table 9. Observations on general plant maintenance observed during walk-through inspection of the Orting WTP, July 6, 1984.

Observed Element	Condition	Comments
Inlet structure	Good	Little buildup of scum, rags, or other debris. Comminutor does not remove solids.
Water color	Good	Both ponds were dark green in color, large patches of red crustaceans (daphnia) observed on primary cell at surfaces ($\geq$ 10 cm), pH above 7.0; some scum observed on surface; bubbling observed in secondary cell.
Weed growth		
- aeration pond	Good	Duckweed around edges of aeration pond. Duckweed covered 50% of polishing pond. Surface wind blowing from east; without wind, 100% cover possible.
- polishing pond	Poor	
Pond liner		
- aeration pond	Poor	Large bubbles in liner extending up from the bottom of the aeration pond. Bubbles appear to rise and fall and change size - observed throughout the pond, but mostly around aerators, disturb surface wave action.
- polishing pond	Good	
Pond diking	Good	Dikes were in good condition with the exception of rodent burrows observed on south side diking - both ponds.
Tall plant control	Poor	Tall plants observed growing along eastern shoreline impeding wind action - some steps had been taken to control growth.
Dike seeding	Excellent	Good growth of grasses on outer dike - no sign of erosion.
Outlet structure	Poor	Pier preventing discharge of floating material from the polishing pond was unsafe to walk on. Excessive solids were flushed into chlorine contact chamber when outlet area was cleaned.
Flood control and outlet gate	Poor	Signs of vandalism with sticks and rocks propping flapper gate open and inoperable. Could result in back-flow of river water into plant during periods of high river flow.

Table 10. Mazza Cheese Company wastewater budget to the WTP from December 1983 to September 1984 including the Class II inspection data July 31 - August 1, 1984.

			meters (+)3/ (ft3)			meters (-)4/ (ft3)			Flow to WTP/month		Avg. Daily5/ Flow (gpd)	Daily6/ Discharge During Production (gpd)
Month1/	(days)	Production Days2/	#4	#37/	#2	CS	LR	Boiler	Ft3	gal.†		
Dec.	(31)	28	9,9970	--	11,782	72,834	52	922	37,944	283,821	9,155	10,136
Jan.	(31)	26	8,5470	--	6,654	63,930	60	624	27,510	205,775	6,638	7,914
Feb.	(29)	24	8,9070	3,430	12,539	65,495	113	857	38,574	288,534	9,949	12,022
Mar	(31)	29	7,8020	64,310	2,691	74,385	101	561	69,974	523,406	16,884	18,048
Apr.	(30)	26	7,3490	57,090	2,633	67,941	98	468	64,706	484,001	16,133	18,615
May	(31)	30	7,7860	65,550	2,652	67,794	129	682	77,457	579,378	18,690	19,313
June	(30)	29	8,2570	63,700	2,700	75,134	94	223	73,519	549,922	18,331	18,963
July	(31)	30	8,1870	59,750	3,135	13,453	98	130	71,074	531,634	17,149	17,721
Aug.	(31)	27	8,8570	58,900	2,120	78,987	156	4,442	66,005	493,717	15,926	18,286
Sept.	(30)	25	7,3720	50,950	2,093	59,533	198	756	66,276	495,745	16,525	19,830

1/Flow meters read first of month and recorded on worksheet on month read: January readings = December water use.
2/Production days/month for Mazza Cheese Company. Information obtained from company office records.
3/Meters #2, #3, #4 = water consumed/month.
4/Meters - cooling system, CS; lunchroom, LR; and boiler = water not going to WTP.
5/Flow WTP/# working days = daily discharge during working hours.
6/Flow WTP/# days in month = average daily flow.
7/Meter installed second week of February 1984.

†Ft3 (7.48) = gallons.

Table 11. Wastewater flow (gpd), BOD5 loading (lbs/day), and concentration (mg/L) for the Washington State operated Soldiers Home, Orgin, Wa., August 1984

Population Unit	Number of Units	Wastewater Flow 1/ Range (gpd/unit)	Typical (gpd/unit)	Total Flow (gpd)	BOD5 2/ Concentration (mg/L)	BOD5 3/ Loading (lbs/day)
Residents	188	52.8 - 119	92.5	17,390	360	52.3
Employees full-time	125	5.3 - 15.9	10.6	1,325	360	3.98
Employees part-time	82	5.3 - 15.9	10.6	84.8	360	0.25
Totals				18,800		56.5

1/
2/
3/

Table 12. Comparison of WDOE and Sumner WTP laboratory results of WDOE samples from Orting WTP including results from U.S. EPA water pollution quality control check samples analyzed by Sumner - Orting WTP Class II inspection July 31 - August 1, 1984.

Sample	BOD_5		Total Suspended Solids (mg/L)		BOD_5		Total Suspended Solids (mg/L)	
	WDOE Analysis	WTP Analysis	WDOE Analysis	WTP Analysis	EPA Analysis	WTP Analysis	EPA Analysis	WTP Analysis
Influent	645	504	680	457				
Effluent	40	26	32	50				
Mazza Cheese Company	2,600	2,047	640	591				
EPA Conc. #1							35[1/]	26
EPA Conc. #3					2.6[2/]	2.6		
EPA Conc. #4					103[3/]	84		

1/True value. 95 percent confidence interval = 26.0 - 34.6 $\bar{X}$ = 30.3
2/True value. 95 percent confidence interval = 1.3 - 4.0
3/True value. 95 percent confidence interval = 76.4 - 130

Send up Yakce Inhibited BOD report to HAC.

LABORATORY PROCEDURAL SURVEY

Discharger: Orting Facultative Aeration Ponds

NPDES Permit Number: ______

Date: 7/31/84

Industrial/Municipal Representatives Present: Greg Kongslie, Sumner WTP Operator - Laboratory tech

Agency Representatives Present: Dale Clark

I. COMPOSITE SAMPLES

A. Collection and Handling

1. Are samples collected via automatic or manual compositing method? Manual, Model? Manning

a. If automatic, are samples portable ______ or permanently installed ______?

Comments/problems ______

2. What is the frequency of collecting composite samples? every 2 hours during the day

3. Are composites collected at a location where homogeneous conditions exist?

a. Influent? yes

b. Final Effluent? yes

c. Other (specify)? Massa Cheese time Comp.

4. What is the time span for compositing period? 6 hours

Sample aliquot? ______ mls per ______ minutes

5. Is composite sample flow or time proportional? time

Mettler H 33 Scale
YSI Model 54 O_2 meter
Precision Scientific Incubator Freas 815
Orion Analog pH meter / model 301.

457 mg/L Orting influent (WTP Analysis 8/8/84)
26.0 mg/L TSS

6. Is final effluent composite collected from a chlorinated or non-chlorinated source? most of the time unchlorinated sometimes chlorinated

7. Are composites refrigerated during collection? no Ice

8. How long are samples held prior to analyses? hopefully 24 hours

margaga 6-7 hour composites no Ice even

9. Under what condition are samples held prior to analyses?

   a. Refrigeration? yes - run next morning

   b. Frozen? ______

   c. Other (specify)? ______

10. What is the approximate sample temperature at the time of analysis? 1 hour to warm up - close to room temp

11. Are compositor bottles and sampling lines cleaned periodically? ______

   a. Frequency? ______

   b. Method? ______

12. Does compositor have a flushing cycle? yes

   a. Before drawing sample? ✓

   b. After drawing sample? ✓

13. Is composite sample thoroughly mixed immediately prior to withdrawing sample? ______

:commendations:

II. BIOCHEMICAL OXYGEN DEMAND CHECKLIST

A. Technique

1. What analysis technique is utilized in determining BOD_5?
   - a. Standard Methods? ______ Edition? ______
   - b. EPA? ______
   - c. A.S.T.M.? ______
   - d. Other (specify)? ______

B. Seed Material

1. Is seed material used in determining BOD? When chlorine is detected
2. Where is seed material obtained? From 24 hr settled Summer influent
3. How long is a batch of seed kept? 24 hours settling + 3-4 test and under what conditions? (temperature, dark) kept in 1 liter beaker, dark incubator @ 20° C
4. How is seed material prepared for use in the BOD test? 10 ml pippette off top of column

Recommendations:

______

Precision Scientific Thelco model 16 High Temp Oven

C. Reagent Water

1. Reagent water utilized in preparing diultion water is:

   a. Distilled? purchased - retailer ships Bonneaus distilled drinking water

   b. Deionized? ____________

   c. Tap ________, chlorinated ________ non-chlorinated ________

   d. Other (specify)? ____________

2. Is reagent water aged prior to use? yes

   How long? 3-4 weeks, under what conditions? kept in chlorine room and cases on floor in lab

Recommendations:

DO on blank is 9.0 9.1

D. Dilution Water

1. Are the four (4) nutrient buffers added to the reagent water? yes

   a. 1 ml mls of each nutrient buffer per 1000 mls of reagent water

2. When is phosphate buffer added (in relation to setting up BOD test)? no specified order

3. How often is dilution water prepared? before each test
   Maximum age of dilution water at the time test is set up. ≤ 1 hour

4. Under what conditions is dilution water kept? kept in incubator 20 °C ± 1 °C

5. What is temperature of dilution water at time of setup? ≈ 20°C maybe less slightly

Recommendations:

E. Test Procedure

1. How often are BOD's being set up? 2 × / month 15th and 30th

What is maximum holding time of sample subsequent to end of composite period? 24 hours

2. If sample to be tested has been previously frozen, is it reseeded? ______ How? ______

Steve Robb

when using centrification S.M.'s for analyzing Cl⁻ range of DO drop (1.5 mg/L) but in wrong

3. Does sample to be tested contain residual chlorine? yes sometimes
If yes, is sample

a. Dechlorinated? sometimes

How? KI (10%) 1:50 Acid Solution Starch Sodium Bisulfite

b. Reseeded? yes

How? pipette into dilution water and fill w/ water 4 mls seed / 1000 ml D.W.

4. Is pH of sample between 6.5 and 8.5? No

If no, is sample pH adjusted and sample reseeded? No
Orting monitors own pH ~~meter~~ (meter) will inform?

5. How is pH measured? Litmus?

a. Frequency of calibration? –

b. Buffers used? –

6. Is final effluent sample toxic? No

7. Is the five (5) day DO depletion of the dilution water (blank) determined? Yes, normal range? .1 mg/l

8. What is the range of initial (zero day) DO in dilution water blank? ~~[illegible]~~ 9.1 9.5

9. How much seed is used in preparing the seeded dilution water? 4 ml / 1000 ml

10. Is five (5) day DO depletion of seeded blank determined? Yes
If yes, is five (5) day DO depletion of seeded blank approximately 0.5 mg/l greater than that of the dilution water blank?
usually about .2 - .3 DO drop

11. Is BOD of seed determined? yes

12. Does BOD calculation account for five (5) day DO depletion of

A 4 ml DO seed dil / 1000 m = 1.5 / 300 / 300 = DO drop figure.

a. Seeded dilution water? yes

How? by subtracting out initial seed depletion water percentage

b. Dilution water blank? yes

How? by subtracting out difference in five day blank DO

13. In calculating the five (5) day DO depletion of the sample dilution, is the initial (zero day) DO obtained from

a. Sample dilution? off of sample

b. Dilution water blank? ~~off of~~ blank

14. How is the BOD_5 calculated for a given sample dilution which has resulted in a five (5) day DO depletion of less than 2.0 ppm or has a residual (final) DO of less than 1.0 ppm?

discard samples of end of range of dilutions

15. Is liter dilution method or bottle dilution method utilized in preparation of

a. Seeded dilution water? liter

b. Sample dilutions? to the BOD Bottles

16. Are samples and controls incubated for five (5) days at 20°C ± 1°C and in the dark? yes
use water seals

17. How is incubator temperature regulated? thermostat

18. Is the incubator temperature gage checked for accuracy? yes

a. If yes, how? with thermometer on unit

b. Frequency? visual daily

19. Is a log of recorded incubator temperatures maintained? No

a. If yes, how often is the incubator temperature monitored/ checked? No

20. By what method are dissolved oxygen concentrations determined?

Probe YSI probe for all others Winkler blank uses Winkler Other ______

a. If by probe:

1. What method of calibration is in use? 3 blanks #1 - Winkler #2 YSI calib #3 DO days after 5 day

2. What is the frequency of calibration? daily of new bl.

b. If by Winkler:

1. Is sodium thiosulfate or PAO used as titrant? PAO

2. How is standardization of titrant accomplished? Buy Standardized PAO not In house

3. What is the frequency of standardization? not done did several times very

Recommendations:

Standardize PAO on a weekly basis

F. Calculating Final Biochemical Oxygen Demand Values Washington State Department of Ecology

1. Correction Factors

all three in method

a. Dilution factor:

$$= \frac{\text{total dilution volume (ml)}}{\text{volume of sample diluted (ml)}}$$

b. Seed correction: use DO drop of Seeded Blank

$$= \frac{\text{(BOD of Seed)(ml of seed in 1 liter dilution water)}}{1000}$$

c. F factor ~ a minor correction for the amount of seed in the seeded reagent versus the amount of seed in the sample dilution:

$$F = \frac{\text{[total dilution volume (ml)] - [volume of sample diluted ml]}}{\text{Total dilution volume, ml}}$$

2. Final BOD Calculations

a. For seed reagent:

(seed reagent depletion-dilution water blank depletion) x D.F.

b. For seeded sample:

(sample dilution depletion-dilution water blank depletion-scf) x D.F.

c. For unseeded sample:

(sample dilution depletion-dilution water blank depletion) x D.F.

3. Industry/Municipality Final Calculations

Recommendations:

- water bath Thermomite in Incubator
- PAO standardize DO Titration
- check with Steve R → Cl^- neutralization

III. TOTAL SUSPENDED SOLIDS CHECKLIST

A. Technique

1. What analysis technique is utilized in determining total suspended solids?

   a. Standard Methods? ✓ Edition 14th

   b. EPA? ______

   c. A.S.T.M.? ______

   d. Other (specify)? ______

B. Test Procedure

1. What type of filter paper is utilized:

   a. Reeve Angel 934 AH? ______

   b. Gelman A/E? ______

   c. Other (specify)? ______

   d. Size? 9 cm glass fiber g f/c

2. What type of filtering apparatus is used? buchner funnel

3. Are filter papers prewashed prior to analysis? yes

   a. If yes, are filters then dried for a minimum of one hour yes at 103°C-105°C yes?

   b. Are filters allowed to cool in a dessicator prior to weighing? yes

4. How are filters stored prior to use? used immediately

5. What is the average and minimum volume filtered? Avg Inf. 100-200 ml
Avg eff. = 200-250 ml

6. How is sample volume selected?

   a. Ease of filtration? ______

   b. Ease of calculation? ______

   c. Grams per unit surface area? ______

   d. Other (specify)? to filter in three minutes

7. What is the average filtering time (assume sample is from final effluent)? 3 minutes

8. How does analyst proceed with the test when the filter clogs at partial filtration? throw away and start over

9. If less than 50 milliliters can be filtered at a time, are duplicate or triplicate sampe volumes filtered? no

10. Is sample measuring container; i.e., graduated cylinder, rinsed following sample filtration and the resulting washwater filtered with the sample? yes

11. Is filter funnel washed down following sample filtration? no
Filter funnel

12. Following filtration, is filter dryed for one (1) hour, cooled in a desscator, and then reweighed? yes

13. Subsequent to initial reweighing of the filter, is the drying cycle repeated until a constant filter weight is obtained or until weight loss is less than 0.5 mg? no

14. Is a filter aid such as cellite used? no

a. If yes, explain: ______________________

____

Recommendations:

____

____

____

____

____

____

____

____

____

____

C. Calculating Total Suspended Solids Values Washington State Department of Ecology method used

A. $\text{mg/l TSS} = \frac{A-B}{C} \times 10^6$

1. Where: A = final weight of filter and residue (grams)

B = initial weight of filter (grams)

C = Milliliters of sample filtered

2. Industry/Municipality Calculations

Recommendations:

SPLIT SAMPLE RESULTS:

Origin of Sample ______________________

Collection Date ______________________

BOD		TSS		EPA BOD Standard	
DOE	IND./MUN.	DOE	IND./MUN.	DOE	IND./MUN

Seed CALC. See Std. Methods 14th edit pg 549.
ratio of Seed ~~to~~ Sample to Seed Control

1978 Chev 4WD w/ camper 5400 258-3371